



Drip Irrigation

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TOOLS:

- [Hole punch \(1\)](#)
- [Scissors or knife \(1\)](#)
- [Thermos \(1\)](#)

PARTS:

- [Backflow preventor \(1\)](#)
- [Pipe tape \(1\)](#)
- [Hose Y connector \(1\)](#)
- [Timer \(1\)](#)
Simple programmable ones cost about \$40.
- [Y filter \(1\)](#)
- [Pressure regulator \(1\)](#)
- [Hose beginning \(1\)](#)
- [Mainline tubing \(1\)](#)
comes in rolls
- [Mainline tubing \(1\)](#)
comes in rolls
- [Dripline \(1\)](#)
- [Elbow fittings \(3-4\)](#)
depending on terrain
- [Coupler fittings \(1-2\)](#)
- [Valves \(2\)](#)
- [End fitting \(1\)](#)

- [Goof plugs \(4\)](#)
- [Hose barbs \(4\)](#)
- [Misters \(2\)](#)
- [Stakes \(2\)](#)
- [Hold-downs \(8\)](#)

and more would be better. You can also make your own from strong wire.

SUMMARY

Most vegetables prefer soil that's neither soggy nor dry, and earthworms and beneficial microorganisms do too. When there's too much water, these organisms drown. Too little, and you find yourself with dead plants and a reputation as a "brown thumb."

How much is too much, and how little is too little? How often should you supply water, and how can you remember to do so?

Drip irrigation answers these dilemmas, giving plants the perfect amount that they need to thrive, and saving water at the same time. Irrigation also keeps water off the leaves of the plants, preventing nasty maladies like leaf mildew, and you'll suffer fewer weeds by delivering water only to the plants that you want to grow.

The chief drawbacks to drip irrigation are cost, the use of plastics, and the time and trouble for installation and maintenance. For these reasons, I believe that drip irrigation is best reserved for your vegetable garden. For the rest of your yard, try to find plants that are adapted to your climate and don't need supplemental watering.

In this article I'll explain how to assemble a typical layout to water a vegetable garden in a raised bed of quality soil.

The array of tiny plastic drip irrigation parts and supplies can seem confusing at first, but the principle is simple: you're simply piecing together a stretch of hose that leaks.

The materials listed below are for a 4'×8' raised vegetable bed. All the parts recommended for this project have hose threads.

Drip Irrigation 101

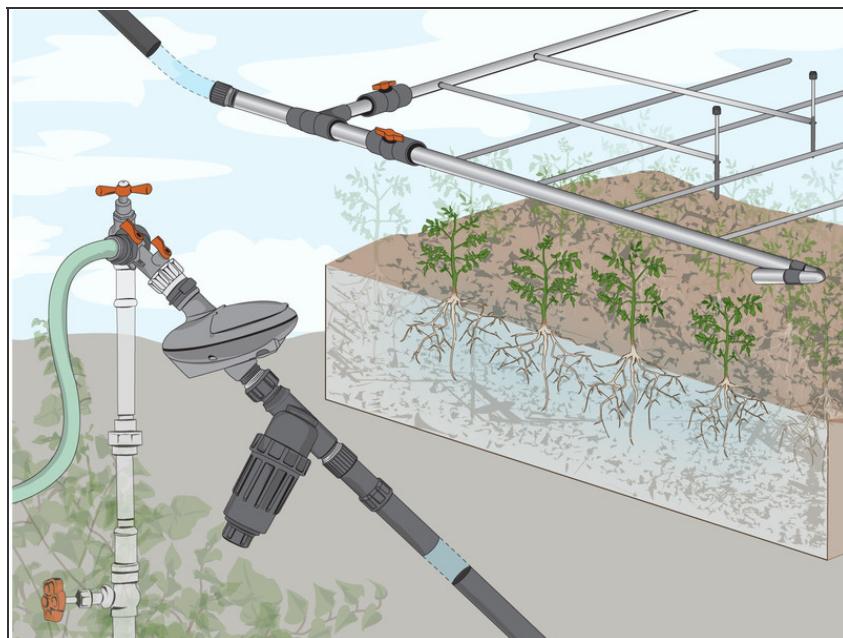
Hose Threads vs. Pipe Threads

A word about the two types of threads you'll encounter with drip irrigation parts. Hose threads, used on garden hose and outdoor faucets, are more widely spaced than pipe threads. Drip irrigation parts may have either hose threading or pipe threading, the latter often being identified as "NPT," referring to the National Pipe Thread standard. If you try to attach a pipe thread to a hose thread, you'll strip the threads.

Teflon Pipe Tape

To prevent connections from leaking, prepare them with teflon pipe tape. Before joining two threaded parts, wrap the tape around the male thread in the same direction that the second part will turn when you attach it. Hand-tighten all plastic connections; a wrench can damage the delicate threads.

Step 1 — What are 3 sections of a drip system?



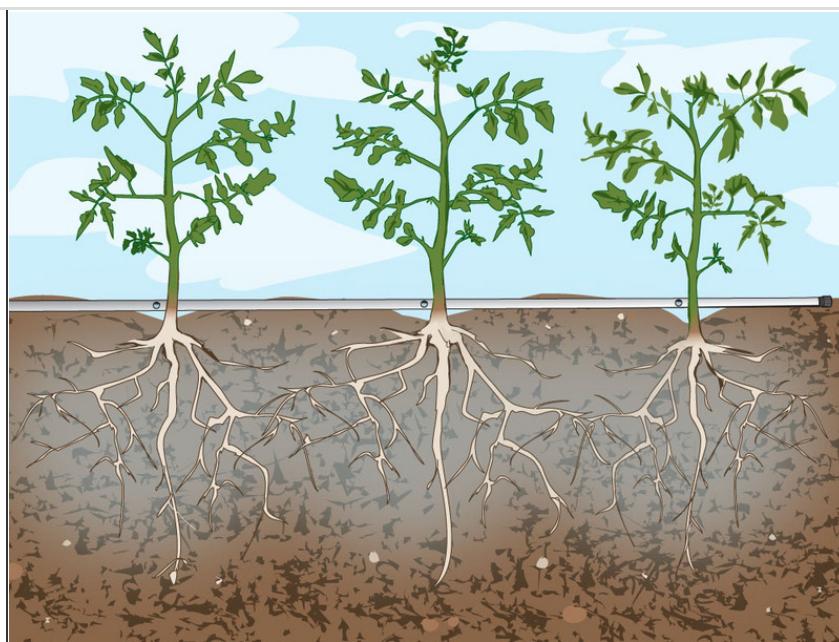
- A simple drip irrigation system consists of 3 sections: the parts near the faucet, which I'll call the "headworks"; the mainline tubing; and the parts that drip, which I'll call the "drippy parts."
- The headworks perform 3 tasks: reducing water pressure, filtering your water supply, and turning the system on and off. The mainline tubing distributes the water to your vegetable bed, and the drippy parts drip, creating localized volumes of moisture beneath the soil. For your raised vegetable bed, you'll lay out parallel lines of emitter tubing to create a grid of evenly moist spots across the bed, and you'll add some misters for starting seeds.

Step 2 — Assemble the headworks.



- Most drip irrigation suppliers offer kits that contain all the headworks parts that you'll need in one box, plus a few extras. If you plan your project carefully you can skip the kit, omit the extras, and save a little money by buying just the parts you need.
- The headworks begin with the hose bib (aka "faucet") that you probably have in your yard. It needs to be in good condition, since you'll be leaving the valve open all the time. If it leaks, fix or replace it.
- Starting at the hose bib, thread together the parts in the following order, remembering to add a few wraps of teflon tape around each thread before you connect it.
- **Backflow preventers (aka anti-siphon devices)** are required by code in many places, this part prevents water from being siphoned from your irrigation lines back into your water supply. This keeps potential pathogens that might be lurking in fertilizer and soil from contaminating your drinking water. Many new homes may already have them installed on outside faucets.
- Backflow preventers come in plastic and brass versions; brass costs more, but lasts longer. They have an arrow etched into them, which must point in the direction of water flow.
- **Hose Y connector with valves** allow you to keep an additional garden hose connected for hand watering, dog washing, and other purposes. A brass one will last longer than a plastic version and is less likely to break or leak. The Y should be fitted with 2 small valves so that you can shut off either the drip system or the hose independently.
- Nothing kills plants faster than inconsistent watering, especially in hot weather. A **timer** takes the flakiness factor out of your gardening endeavors, getting water to those plants when you're still in bed shaking off a hangover. For this basic system you'll use a battery-operated timer, which you should be able to pick up for around \$40. Get one with an LCD display that lets you set custom watering times during the day.

Step 3



- The small apertures of drip emitters are easily clogged by dirt, rust, and hard water deposits in your water supply. Drip irrigation **filters** have a mesh inside that catches this gunk. For the type of emitters you'll be using you need to get a Y-type filter, so named because it has 3 threaded fittings: 1 input that you'll connect to the output of the timer, 1 output that you'll connect to the pressure regulator, and 1 valve or cap at the bottom of the filter that you'll open periodically to flush out sediment that may have accumulated in the mesh.
- Drip irrigation systems operate at low water pressure, usually less than 25psi. Most municipal supplies deliver water at a higher pressure than this. Without the **regulator** to step down the pressure, the connections in your drip system will leak or burst. Pressure regulators are specified by output pressure, measured in pounds per square inch (psi) and flow rate, measured in gallons per minute (gpm).
- For your drip emitters, you need a regulator rated at 25psi or less. Most entry-level pressure regulators (\$6 or so) can handle a flow rate of 0.5–0.7gpm, which is more than enough for a small

vegetable bed. The pressure regulator should have hose threads, and will have a little arrow on it to show the direction of flow.

- **Female hose beginning (FHB) and ½" mainline tubing:** You're almost done assembling your headworks. The last step is to stick the ½" mainline tubing into the female hose beginning. This is easier to do before you attach the FHB to the pressure regulator.
- Mainline tubing, made of black, flexible polyethylene, is the main artery of your drip system, carrying the water from the headworks out to your garden beds. You can cut it with scissors or pruners. Mainline tubing is inserted into compression fittings, which means it's jammed in, not screwed in. The FHB has a compression fitting on one side and a hose thread on the other.

Step 4



- Once you've inserted the mainline tubing into the FHB, simply thread the end of the FHB onto the end of the pressure regulator, and you're done assembling the headworks — but not quite ready to lean back and crack a beer just yet. You still have to place the tubing to distribute the water to the vegetable bed.
- Compression fittings can be difficult to work with, especially on cold days, when the plastic is stiff. To make it much easier, put some boiling water in a thermos. Stick the tubing into the boiling water for a few seconds and then insert it into the compression fitting, rocking it back and forth to make sure it goes in all the way.
- There are other kinds of proprietary fittings, such as Smart-Loc, that cost a bit more but are easier to assemble and disassemble than compression fittings. Consider this alternative if you think you may need to disassemble or reconfigure the system subsequently.



Step 5 — Assemble your mainline tubing and fittings.



- Your **mainline tubing** should be protected from the sun as much as possible to extend its lifespan. (It's also ugly, and covering it will make your garden look more like Versailles). Burying it in mulch is an ideal way to prevent damage from dogs, people, and lawnmowers.
- Roll out the tubing gently to prevent it from kinking. And if you're working on a hot day, remember that it can contract when it gets cold. Leave a little bit of slack to prevent problems later.
- Mainline tubing is pretty flexible, but if you need to add a branch or make a hard turn, you'll need an **elbow or tee fitting**. Like all the parts you'll be working with after the headworks, these are compression fittings.
- Most likely you'll thrust a shovel through your tubing at some point, or you'll trim it too short while you're laying it. Have a few **couplers** on hand, to splice together broken lines.
- Use 2 **valves** to switch between the drip emitter tubing and the misters.
- Once you've placed the mainline tubing along the short end of your vegetable bed, turn on the water to flush out dirt that may have found its way into the fittings.

- Next you'll cap off the far end of the mainline tubing by kinking it, using a **figure-8 end fitting** to hold it. Insert the end of the mainline tubing into one hole of the figure 8, bend it back a few inches, and insert the end again into the other hole. Turn on the water again and check for leaks.

Step 6 — Assemble the drippy parts.



- With the mainline tubing run out to the vegetable bed, you're ready to insert the $\frac{1}{4}$ " dripline that will actually water the bed. Start by running the dripline straight down the long side of the bed at even intervals spaced at about 9"-12" on center. If your bed is 4' wide, 3 or 4 driplines should be enough.
- For intensively planted vegetable beds less than 15' long, use $\frac{1}{4}$ " **dripline** with emitters (drippy points) embedded every 6".
- Dripline is not the same as "soaker hose," which is made out of recycled tires and leaks water along its entire length. While soaker hose is cheaper and easier to find, it tends to distribute water unevenly along its length.
- To install dripline, simply cut it to length, insert a "goof plug" at the far end to plug it, and insert a double-ended hose barb to connect the other end with the mainline tubing. Use your hole punch to make a small hole in the mainline tubing, then insert the hose barb into the hole.
- To keep each dripline in place, use 2 or more **hold-downs**. You can cut 2 lengths of wire, each 24" long. Bend them in half to create an inverted U shape and use the pair to hold the dripline flush with the soil. I like to use chain-link fence bottom wire, but coat hanger wire will also work. You can also purchase hold-downs.



Step 7



- Drip irrigation is great for established plants, but its localized moisture won't work for starting seeds. You could hand-water until the seedlings are established, but I use 360° misters that come on a little stake with a 9" riser.
- To connect the mister, use $\frac{1}{4}$ " mainline tubing with a barb at the end. Insert the barb into the $\frac{1}{2}$ " mainline tubing as you did for the dripline.
- While you can run misters and dripline at the same time, you'll probably want to alternate, using the misters to get the seeds going and switching over to the dripline once the plants are established. To do this, connect the misters to a separate section of $\frac{1}{2}$ " mainline tubing controlled with a valve.

Planting

Once you've installed your drip system, turn it on before you plant. Note the irrigation pattern at the surface and, after running the water for at least $\frac{1}{2}$ hour, dig down and take a look at the underground moisture pattern.

If you're transplanting seedlings, you'll need to make sure to place the roots so that they pick up water from the dripline. Plants with larger roots, such as tomatoes, can be placed farther from driplines; carrots and beets need to be placed closer. But all plants need moisture, and especially when dealing with small seedlings, beware of dry spots at the surface of the soil.

Mulch Mulch Mulch

Once your seedlings are a few inches tall, apply organic mulch in the form of leaves, finished compost, straw, grass clippings, or wood chips. Mulch conserves water, makes your plants healthier, and protects your drip tubing from UV sunlight damage. Mulch ain't optional — if you want healthy plants you need to mulch!

Watering: When and How Long?

Many variables determine when and how long to water: temperature, humidity, root depth, and hours of sunlight, to list a few. For most mature vegetables, you need to moisten the soil to a depth of 2'. Younger vegetables require less.

One objective way to determine whether you're watering long enough is to run your system and simply dig a hole and see how deeply the water penetrated. Despite a lot of advice to the contrary, recent research indicates that frequent light watering is better than infrequent deep watering, but this is a highly divisive topic among gardeners. Depending on the time of year, the heat, and the humidity, you'll probably need to run your drip system 10–40 minutes each day. Plants prefer to be watered in the early morning hours.

Maintenance

Check your system while it's running, at least once a week. Occasionally an emitter or other connection will pop out under pressure, or be kicked out by kids or dogs. You'll also need to replace the battery in the timer periodically.

Take time to unscrew the cap on the bottom of the filter, and run the water to flush it out.

Having an automatic system is not a license to ignore the garden. Bad things happen — pests and bugs, in particular — when you don't pay attention to your veggies. Go out and visit them. To prevent your plants from getting waterlogged, turn off the system during rainy spells.

If you live where the ground freezes in winter, you need to protect your drip system from ice damage. You need to bring in the headworks, any valves, misters, and emitters. Mainline tubing can be left in place, but should be drained or blown out with an air compressor. Then cap the beginning of the mainline tubing, or tie a plastic bag around the opening. Fittings are especially vulnerable to bursting, so make sure you lift each one to drain out the water.

Critters

Gophers and some breeds of dogs are notorious for treating driplines as water-filled chew toys. In a raised bed you can prevent this by lining the bottom with hardware cloth, which is actually a wire mesh.

Going Bigger

For larger plantings, get what farmers use: T-Tape or similar drip tape. Your headworks

assembly will be the same, with the exception of a lower-pressure regulator. You'll still use $\frac{1}{2}$ " mainline tubing, but the fittings for T-Tape are slightly different. T-Tape is a specialized product you won't find at a big box store, so I recommend getting a kit from an online supplier that will have all the parts you need.

While less durable, drip tape is more economical than $\frac{1}{2}$ " dripline. For small vegetable plots the $\frac{1}{4}$ " dripline makes more sense, since, unlike drip tape, you don't need to get it in large quantities.

This project first appeared in [MAKE Volume 18](#), page 72.

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